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Abstract

Discussions around the growing difference in wealth, as well as its distribution, has gained prominent attention recently. What are the possible causes that could potentially contribute to the difference in wealth and its distribution? In this paper, we propose a novel reason, i.e., famine. We combine contemporary individual-level wealth data with historical data on famine severity in China and show that exposure to famine has a negative effect on the wealth of individuals born during this period. We further pursue a number of strategies to determine whether the relation we uncover is, in fact, causal.

Keywords: Wealth Distribution, Inequality, Famine, China

JEL Codes: D31, O15, N35

I. Introduction

The distribution of income and wealth is a widely discussed and controversial topic (Piketty and Saez, 2014). In particular, discussions on the growing difference in wealth, as well as its distribution, has gained prominent attention recently, ranging from academic and popular media to the political spectrum. In response, a large body of literature has proposed various reasons that could potentially contribute to the difference in wealth as well as its distribution within as well as between countries. Popular reasons include $r > g$ (interest rate is higher than the growth rate), institutional legacy (e.g. democracy, slavery, apartheid), tax policy (e.g. inheritance tax, estate tax), the geographical distribution of resources (e.g. oil), property rights, and caste system to name a few. However, existing studies mostly draw on simple correlations and unable to establish a causal mechanism underlying the relationship.[1] Furthermore, there are still yet unexplored reasons that could lead to inequality in the longer run.

In this paper, we provide a novel reason, i.e., famine. In particular, we use difference-in-difference method and examine the effect of the Chinese population's exposure to the Great Famine (1959–61) at different periods of their life on wealth inequality in present-day China. Furthermore, we pursue a number of strategies to determine whether the relation we uncover is, in fact, causal.

Combining contemporary individual-level wealth data with historical data on famine severity by province, we question whether the exposure to the famine contributed to the development of wealth inequality within China. Our hypothesis builds on well-established insights from the medical and health literature suggesting that exposure to a fragile environment during a person's early life can have persistent and profound impacts later (Barker, 1990; Almond and

[1] Recent literature such as Jakobsen et al. (2020) is an exception.

Currie, 2011). Using province-by-cohort level variation in exposure to the famine as a quasi-experiment, we find that the famine accounted for a substantial decline in wealth for individuals born during this period. In fact, our estimation reveals that on average, a one percentage point increase in exposure to the famine led to a 1.4–2.0 percent decline in wealth. In terms of magnitude, the famine we examine caused an average decline in wealth of 29.6–52.0 percent for those individuals born during this period.

During the period on which we focus, China also experienced additional events, including a sharp decline in the birth rate during the famine and a sharp increase in the birth rate immediately after the famine that may also affect the wealth distribution. We formally test whether these events affect our main findings. First, we run a placebo test to check the parallel trends before and after the famine and obtain no statistically significant results. Second, we test our findings through an alternate direct measure of famine severity to confirm whether any bias associated with the size of the survivor birth cohort drives our results. This is because this may reflect endogenous fertility decisions during this extreme period and would fail to capture the mortality rates of adults and the elderly. We consider the province-level excess mortality rate during this period as a direct major of famine severity and obtain results consistent with our main findings.

This paper ccontributes to the existing literature (Deshpande, 2000; Alvaredo and Atkinson, 2010; Alvaredo et al, 2013; Deere et al., 2013; Piketty, 2014; Atkinson, 2018; Alvaredo et al., 2018) by introducing a potential new driver of wealth inequality in the economy. We also contribute to a deeper understanding of the long-term legacy of economic inequalities arising from specific historical events. Earlier studies, including Deshpande (2000) and Alvaredo and Atkinson (2010), examine institutional policies or mechanisms that generally last for a very long period of time. For example, it is believed that South Africa and Brazil are among the most unequal countries

in the world due to the legacies of apartheid and slavery (Brazil was the last major country to abolish slavery in 1887), respectively. Similarly, inequality is arguably high in India owing to the historical presence of the caste system. Our findings contribute to a deeper understanding of the effect of a short-term fragile environment on inequality in the longer run. In particular, our findings suggest that the consequences of fragile and extreme events (in our case, famine) may not only cause a deterioration in short-run economic and social outcomes, which is well known, but could also lead to substantial future economic inequality over the longer run.

This is an interesting finding because inequality has risen rapidly in China recently. In evidence, Piketty et al. (2019) conclude that China's levels of inequality were close to those of the Nordic countries in the late 1970s, but are now approaching those of the US. Notably, the biggest increase took place between the mid-1980s and mid-2000s. Our findings contribute to the literature exploring the potential mechanism for the rapid rise in inequality in China since the mid-1980s as the famine cohorts entered the labor market during the same period. Nonetheless, our focus on the historical determinants of wealth inequality should not imply that other factors are unimportant. A number of existing studies have shown the importance of determinants such as escalating housing prices, differential saving, capital accumulation, and changes in the legal system of property contributing to wealth inequality in China (e.g., Li and Wan, 2015; Knight et al., 2017; Piketty et al., 2019). As we demonstrate, a strong historical legacy on wealth inequality remains in China even today.

This study also broadly relates to the literature that examines the effect of exposure to famine, including Neugebauer et al. (1999), Ravelli et al. (1999), Brown et al. (2000), Hulshoff Pol et al. (2000), Chen and Zhou (2007), Meng and Qian (2009), Neelsen and Stratmann (2011), and Dercon and Porter (2014). Together, these illustrate that exposure to famine in general and in

utero exposure to famine in particular have a significant effect on health and labor market outcomes in the long run. Furthermore, Almond et al. (2010) find the negative effect of in utero exposure to famine on adult economic status in terms of housing size. Our findings thus complement this literature by additionally suggesting that exposure to famine could create a substantial amount of wealth inequality within a society.

The remainder of the paper is organized as follows. Section II provides a brief background of the Great Chinese Famine. Section III describes the data used in the analysis. Section IV discusses our identification strategy. Section V presents the main results. Section VI presents the placebo test and other robustness checks of our analysis. Section VII concludes.

II. The Great Chinese Famine (1959–61)

Although there is some controversy over the exact timing of China's Great Famine, economic research mostly agrees that it began in 1959 and ended in 1961. Furthermore, the extant literature on China's Great Famine also debates the factors that primarily led to what ultimately became a nationwide calamity. One strand of research argues in favor of the food availability decline (FAD) hypothesis that most associate with the Great Leap Forward (GLF) and the collectivization of agriculture that began in 1958 (Lin, 1990; Yao, 1999). The GLF and the collectivization of agriculture resulted in a drastic decline in grain production in 1959, and this continued for the next two years before coming to a halt in 1962. Another belief is that food wastage from communal dining during the GLF was also partly responsible for the famine (Chang and Wen, 1997).

In contrast, an alternative strand of research focuses on those factors that led to entitlement failure. For example, it is believed that overzealous officials exaggerated grain production figures to make a good impression about the success of collectivization and exported rice to the urban population and that this intensified famine in rural areas (Lin and Yang, 2000; Meng et al., 2015).

Furthermore, recent findings by Kasahara and Li (2019) suggest some evidence that grain exports used to repay loans from the Soviet Union and the import of industrial equipment to promote the GLF further intensified the famine in China.

Regardless of the causes, both the urban and rural populations in China experienced an increase in mortality rates during the famine years. However, the rural rate in 1960 was 2.6 times the pre-famine rate (Gørgens et al., 2011). Urban residents fared better, but were not spared, with death rates at their peak in 1960 being 80 percent above their pre-famine level (Almond et al., 2010). Furthermore, the intensity of famine varied by province. For example, Anhui and Sichuan were among the worst affected provinces, whereas Heilongjiang, Inner Mongolia, and Beijing were among the least affected. Nevertheless, the famine caused an estimated 23–30 million excess deaths in China (Ashton et al., 1984; Peng 1987). From the perspective of the excess number of deaths, the Great Chinese Famine outstrips any other famine in recorded history.

III. Data Sources and their Description

The greatest concern when studying the effects of extreme events, such as famine, is the selection effect arising for those that survive. Several earlier studies have categorically pointed out the potential concerns of attenuation bias caused by the selection for survival (Friedman, 1982; Bozzoli et al., 2009; Gørgens et al., 2012). For example, when famine is severe and mortality rates are high, survivors are more likely to be comprised of selected individuals who have naturally stronger constitutions and are better able to resist the negative effects of famine (Meng and Qian, 2009). Therefore, survivors are typically from the top of the distribution of important characteristics, such as physical resilience, income, and access to nourishment.

Concomitantly, those from the lower parts of the distribution are more likely to die (Gørgens et al., 2012). However, most research that studies the effect of famine either concentrates

on the most vulnerable population, such as the rural population or non-migrants, or does not attempt to control for the selection effect arising from survivorship bias. Meng and Qian (2009) propose a novel solution to address the possible attenuation bias caused by the selection for survival by estimating the impact of famine on the upper quantiles of the distribution of outcomes.

A further concern when studying wealth inequality is that detailed individual-level data on wealth are rarely available. Economic outcomes such as education, working hours, and income, and health data at the individual level are relatively easy to measure from general survey. However, it is quite difficult to measure wealth, especially at the individual level. This is particularly important for our estimation as we wish to examine the impact of exposure to famine at different periods of life on wealth outcomes. Therefore, it is difficult for us to use the common household wealth surveys (such as China Household Income Project (CHIP) and China Family Panel Survey (CFPS)) considered by earlier studies in China to examine the effect of famine on wealth inequality.

We do our best to address these inherent challenges in this paper. We collect data on wealthy Chinese individuals in present-day China from the Hurun Report, which lists wealthy individuals in China and reports their current wealth every year.[2] In addition to individual wealth, it also reports their place of birth and current age. Focusing on these individuals for our sample study has several merits. First, the individuals in our sample are from the upper quantiles of the distribution of wealth outcomes. Therefore, the attenuation bias caused by the selection for survival is minimal, as argued by Meng and Qian (2009). Second, unlike individuals in other countries who mostly inherit their family wealth, almost all the individuals we include in our sample are entrepreneurs self-made by establishing new firms. This is particularly useful as Communist Party

[2]The Hurun Report is quite similar to the Forbes billionaires' list that ranks billionaires globally on their current US dollar wealth holdings. In the Hurun Report, an individual is eligible for ranking if he or she holds a minimum of 2 billion Chinese yuan. http://www.hurun.net/EN/Home/

rule in China restricted the formation of private enterprises until relatively recently. Therefore, most individuals in our sample are less likely to inherit family wealth, and their current wealth holdings are then a good predictor of their lifetime productivity. Third, these individuals are not only entrepreneurs, but also contribute as job creators and innovators, are current and future competitors both in China as well as on the world stage, and have a substantial impact on the Chinese economy. Therefore, our sample population is more likely to display similar attributes.

However, focusing on these individuals for our sample also involves important limitations. Primarily, we are unable to provide the overall impact of famine on wealth inequality in present-day China. The picture we obtain from our estimation is partial because the individuals we consider belong to only the upper quantiles of the wealth distribution and thus do not represent the overall Chinese population today. Our estimation can thus provide some insights into the degree of inequality within the top of the wealth distribution. We should keep this in mind when generalizing our findings. Similar problems could also arise if we estimate the level of inequality from tax data (for example, Alvaredo and Atkinson 2010 on South Africa).

We collect data on the universe of Chinese individuals listed in the report between 2015 and 2017. We restrict our sample to the wealth holdings of single individuals and exclude joint wealth holdings listed in the report, as it is difficult to estimate each individual's share of wealth correctly. Furthermore, of the three years we consider in this paper, only the 2016 report contains each individual's province of birth. As the province of birth is our primary variable used to estimate the variation in the exposure to famine, we construct the panel of individuals (2015–2017) using the 2016 report.

The measure of province-level famine intensity we use for our main analysis is from the 1990 China Population Census. The census reports 1% of the universe of China's population. To

construct the province-level famine intensity, we first calculate the average cohort size for the three years prior to (i.e., 1956–58) and after (i.e., 1962–64) the famine for each province. We then calculate the average cohort size during the famine (i.e., 1959–61) for each province. We measure the famine intensity as the percentage decrease from the average pre- and post-famine cohort size to the cohort size during the famine.[3] This measure then captures the percentage of missing people in the famine cohort in each province.

As the Chinese government restricted internal migration with its family registration system (*Hukou*), regional variation in the missing birth cohort may be a potentially ideal proxy for famine intensity. Our construction of the famine intensity variable is consistent with earlier studies that examine the impact of famine in China (Yao, 1999; Meng and Qian, 2009). However, as a robustness check, in Section VI we conduct a separate analysis considering the excess death rate in each province during this period, as reported in Lin and Yang (2000), and obtain consistent results.

Figure 1 reports the famine intensity of each province in China based on our calculations. As shown, there is sizable variation by province in famine intensity. For example, Anhui and Sichuan are among the most affected provinces, whereas Heilongjiang, Inner Mongolia, and Beijing are among the least affected. Figure 2 reports the log mean wealth (in US dollars) of individuals for each year of birth and by famine intensity. The red and blue lines represent the mean wealth of individuals born in provinces where the famine intensity was above and below the average, respectively. Figure 2 somehow depicts a parallel trend in the wealth holding of Chinese individuals based on famine intensity, except for the extremes.

[3] At the time, Chongqing was part of Sichuan province. Therefore, we consider that the famine intensity of Chongqing equals that of Sichuan province.

Table 1 reports the descriptive statistics for the outcomes and the main individual-level control variables based on total as well as province-level famine intensity. The primary outcome we focus on is the log of total wealth. Table 1 shows that individuals born in provinces where famine intensity was higher than average possess average higher wealth. Furthermore, individuals born in provinces with higher famine intensity are more likely to be born before the famine. These differences underline the fallacy of relying solely on cross-provincial variation in famine intensity to identify the long-run effect. As we explain later, our proposed difference-in-differences (DD) approach uses within-province, cross-cohort variation to identify correctly the effect of famine and controls for the differences between birth cohorts that are common across Chinese provinces. The observed differences in the density of wealth holdings across provinces and the birth of individuals in our sample further suggest some differences in the ex-ante and ex-post cohort-specific trends in wealth holdings that are unrelated to the dismissals. In Section VI, we examine whether there are any pre- and post-famine cohort-specific different trends by performing a falsification test and find no evidence of such trends.

IV. Identification

In this section, we describe our strategy for identifying the effect of the Great Chinese Famine on wealth inequality. Our identification strategy exploits province-by-cohort level variation in famine intensity to provide a causal effect. This is a generalized DD strategy where the principal treatment variables are the interactions between the percentages of the excess mortality rate during the famine period (famine intensity) with a dummy variable identifying those born before and during the famine.[4] In particular, the proposed estimates of the average treatment effect are given by λ_1

[4] We divide the timing of an individual's exposure into two groups after considering earlier studies on the medical effects of famine. See Almond and Currie (2011) for a review.

and λ_2 in the following baseline province of birth, birth year, and year of individual ranking year fixed effects equation:

$$Y_{iypt} = \alpha + \lambda_1(BornDuring_{iy} \times FamineIntensity_p) + \lambda_2(BornBefore_{iy} \times FamineIntensity_p) + \mu Birthyear_y + \delta Birthprov_p + \eta RankingYear_t + \varepsilon_{iypt} \quad (1)$$

where Y_{ipyt} is the outcome of interest for individual *i* born in province *p* and year *y* for ranking year *t*. $FamineIntensity_p$ is the province-level average decrease in cohort size during the famine period in comparison with the general trend (pre and post). $BornDuring_{iy}$ is a dummy variable that takes a value of one if individual *i* was born during the famine (1959–61) and zero otherwise. $BornBefore_{iy}$ is a dummy variable that takes a value of one if individual *i* was born before the famine (1958 or before) and zero otherwise. $Birthprov_p$ are the province of birth fixed effects controlling for the fact that provinces may be systematically different from each other. $Birthyear_y$ are the birth year fixed effects, controlling for nationwide common shocks. $RankingYear_t$ are the individuals' ranking year (in the Hurun Report) fixed effects, controlling for the common change in wealth over time. ε_{ipyt} is a random, idiosyncratic error term. We should be aware that we use a panel of individual data covering 2015–2017. We therefore estimate a random effects model as the individual effects are not correlated with the treatment.

We conjecture that the famine affects those individuals born in 1961 and before. We construct two treatment groups of individuals based on the findings from the literature. For instance, the medical and health literature finds that exposure to famine could have different effects on individuals already born before the famine began, and on those born during the famine period (especially in utero exposure) (Almond and Currie, 2011). Because individuals born after 1961 are

unaffected by the famine, these form our control group.

V. Estimation Results

Table 2 reports the main results. The dependent variable is the natural log of the total amount of wealth held by an individual in US dollars. Each column is a separate regression with various specifications. Columns 1–3 report the main results of estimating equation (1) with various specifications. Our first DD estimate of λ_1 is reported in the first row, with the estimates showing that λ_1 is negative at the 1% level of significance in every specification. After controlling for the various fixed effects in column 3, the results suggest that a one percentage point increase in famine intensity leads to a 1.4 percent decrease in wealth on average. In terms of magnitude, the difference in wealth based on exposure to famine is quite large. In our calculation, the province-level famine intensity was 37.28 percent on average during this period. This implies that at its mean, the famine caused a decrease in wealth of about 52 percent.

Our second DD estimate for λ_2 is reported in the third row of Table 2. As shown, the coefficients are positive but statistically insignificant from zero in every specification. The results show no statistically significant effect of individuals born before the famine and exposed to different famine intensity on wealth holdings. In summary, our overall findings suggest that in utero exposure (born during the famine) to famine has a significant negative effect on wealth, but that otherwise the general effect of exposure to the famine is minimal. We also find that the effect of famine persists in China for at least more than five decades.

As discussed before, we considered the individuals listed in the 2016 Hurun Report and constructed panel data over 2015–2017 as the province of birth is only available in the 2016 report. There may be some concern that our estimations may be misleading as the main results reported in columns 1–3 in Table 2 do not account for those individuals listed in the 2015 and 2017 reports

but not included in the 2016 report. If they are somehow correlated with famine, or disproportionately related at the province level, these excluded individuals in our estimation could produce a biased result. To check the robustness of our findings, we estimate equation (1) considering the wealth of those individuals listed in the 2016 report only. We report the results in columns 4 and 5 with various alternative specifications. As we can see, the results are statistically and quantitatively similar to the baseline specification reported in columns 1–3.

As Figure 2 illustrates, there is a wide variation in individual wealth at the two extremes. One of the reasons is that the sample size in each year (the number of individuals born each year and listed in the report) can be small. Another concern could be that the older and younger cohorts may differ from the middle-aged category on various dimensions, which we may not capture in our estimation. If the unobserved difference somehow systematically correlates in our estimation, it may bias the results. Furthermore, in our baseline estimation, we consider the full sample of individuals to examine the effect of the general exposure to famine (born before the famine variable) on any differences in reported wealth. There might be some concern that the effect of exposure to famine may differ by age. In particular, medical research and recent research in economics find that infants (below five years old) are most vulnerable to such events (Currie and Almond, 2011).

To further test the robustness of our findings, we estimate equation (1) with alternative specifications in Table 3. For comparison, we present the baseline estimation in column 1 that is similar to column 3 in Table 2. In column 2, we estimate the coefficients by restricting our sample to individuals born 15 years before and after the famine (i.e., between 1944 and 1976). Furthermore, in column 3, we restrict our sample to individuals born 10 years before and after the famine (i.e., between 1949 and 1971) and perform our regression analysis. Finally, in column 4, we restrict our

sample to individuals born five years before and after the famine (i.e., between 1954 and 1966) and perform our analysis. The results shown in columns 2–4 are quite consistent and quantitatively similar to our main results reported in column 1.

In summary, we find that the wide variation in individual wealth, especially at the two extremes (the very old and very young cohorts) (Figure 2), is not driving our main findings. Furthermore, we find that childhood exposure to famine (the first 5, 10, and 15 years of life) has no statistically significant effect on wealth holdings, which is consistent with our main findings. Moreover, in line with the 'fetal origins hypothesis' (Barker, 1990; Almond and Currie, 2011), we reveal a significant negative effect of individuals born during the famine on wealth holdings in China.

Up to this point, we have examined the combined effect of exposure to famine on wealth inequality in China. In Figure 3, we present the year-on-year effect of the exposure to famine. Each point in Figure 3 is the estimated coefficient from a separate regression where the treatment groups are the individuals born in that specific year. Thus, each point estimates the effect of being born in that year and the variation in exposure to famine on the differences in wealth (with a 95% confidence interval). For clear visualization, we only plot the effect immediately before and after five years, along with the famine years. As shown, the individuals born in each famine year are negative and significantly different from zero. Unfortunately, we do not have any information regarding an individual's actual date and month of birth, which would have allowed us to examine the mechanism in more detail. We refer this question to future research.

VI. Placebo Test and Other Robustness Checks

Our main estimation results rely on the assumption of a parallel trend, which assumes that the affected and the control cohorts would exhibit parallel trends in the absence of famine. In other

words, the estimated coefficient for the interaction between the dummy for being born during the famine (1959–61) and the famine intensity in each province would be zero in the absence of famine. We first visualize the validity of the parallel trend assumption. Figure 2 shows that those provinces with varying intensities of famine generally exhibit parallel trends. In this section, we provide further evidence on the parallel trend assumptions by performing additional falsification tests.

In our falsification test, we focus on the older cohort already born before the start of the famine (the before cohort) and the younger cohort born after the famine (the after cohort). In our specification, we treat individuals born three years immediately before (1956–58) and after the famine (1962–64) as the placebo-affected cohort for the before and after cohorts, respectively, and we perform a falsification test for each group. Furthermore, as we revealed some heterogeneity in the very oldest and very youngest cohorts, we restrict our cohorts to those born immediately before or after the famine (within six years before and after) and check the robustness of our findings. We present the results in Table 4. Columns 1 and 2 and columns 3 and 4 check the parallel trend assumptions of the before and after cohorts with various specifications, respectively. From Table 5, we find that the differences in wealth holdings between the before and after cohorts are similar and not significantly different from zero. In other words, the falsification test suggests that the wealth holdings of individuals born before and after the famine are unaffected by the province-level famine intensity.

Another potential confounding factor in our main findings could be the measurement of famine intensity. We noted in Section III that we construct the famine intensity measure using the missing birth cohorts from the 1990 census. However, studies on the Great Chinese Famine highlight a sharp decline in the birth rate during the famine period. One could argue that fertility decisions are endogenous, especially during a severe catastrophic situation, such as the Great

Chinese Famine. Furthermore, the missing birth cohort fails to capture the mortality rates of adults and the elderly. Additionally, there is evidence of a sudden increase in the birth rate immediately after the famine, which could inflate the missing birth cohort during the famine period. Therefore, our measure of famine intensity may be severely biased. We provide an additional check for our main findings by estimating equation (1) using the excess death rate as a direct measure of famine intensity.[5]

We present the results in Table 5 with various specifications, and they are similar and statistically consistent with the main results in Table 2. According to the regression estimates in column 3 of Table 5, a one percentage point increase in famine intensity (based on excess death rates) leads to on average about 2 percent decrease in wealth. Comparing this with our earlier estimate, the famine caused a decrease of 29.6 percent of wealth on average (the average excess death rate in the sample is 14.8 percent).

VII: Concluding Remarks

In this paper, we combine contemporary individual-level wealth data with historical data on famine severity in China and found that exposure to famine has a negative effect on the wealth of individuals born during this period. Our results showed that the famine caused an average decline in wealth of 29.6–52.0 percent. Furthermore, we check for a variety of identifying assumptions and placebo tests and provide some evidences that the relationship is causal.

As we have discussed before, it is important to emphasize that we should be cautious when

[5] The province-level death rates are from Lin and Yang (2000). To construct the province-level excess death rate, we first calculate the average death rate for the three years prior to (1956–58) and after (1962–64) the famine for each province. We then calculate the average death rate during the famine (1959–61) for each province and measure the excess death rate as the percentage decrease from the average pre- and post-famine death rate to the death rate during the famine. Note that Chongqing and Hainan were part of Sichuan province and Guangdong province during the famine period, respectively. Therefore, we consider the famine intensity of Chongqing and Hainan equal to Sichuan province and Guangdong province, respectively.

generalizing the findings from this study. In this paper, we rely on wealthy individuals to provide a (plausible) causal effect of exposure to famine on wealth inequality in present-day China. Our estimation can thus provide some insights in to the degree of inequality at the top. Therefore, it would be challenging to obtain insight into the overall effect of exposure to famine on wealth inequality in China. We thus argue that the findings provide a lower bound estimate for the potential long-term consequences of the Great Chinese Famine on wealth inequality. In future, it would be interesting to study the overall effect of the Great famine on wealth inequality in China by exploiting some novel dataset.

The Great Chinese Famine appears to be an extreme example to provide insight into the effect of exposure to famine on wealth inequality. However, famines are not unique to China. Famine has affected hundreds of millions of people alive today in developing as well as developed countries at some point in time during their lifetime (Meng and Qian, 2009). Conflict and fragility are also persistent and still seen in many developing and middle-income countries. For example, drought currently affects more than 22 million people in East Africa, and at least 15 million people are going hungry.[6] Similarly, 6.8 million people currently experience extreme hunger in Yemen, 13.5 million people are in need of assistance in Syria, and 5 million refugees have fled to other countries.[7][8] Thus, viewed more broadly, this study could provide some insight into understanding the present inequality between countries that have faced such events in the past, and the future inequality for those countries that are currently facing these events. Although it is only anecdotal evidence, Ukraine and Kazakhstan have the most unequal wealth distributions (based on wealth

[6] https://www.oxfam.org.uk/what-we-do/emergency-response/east-africa-food-crisis. Accessed October 2, 2018.
[7] https://www.oxfam.org.uk/what-we-do/emergency-response/yemen-crisis. Accessed October 2, 2018.
[8] https://www.oxfam.org.uk/what-we-do/emergency-response/syria-crisis. Accessed October 2, 2018.

Gini index) in the world today, and are countries that have also faced serious famines in the past.[9] Further research on these issues is necessary to provide rigorous analysis at the micro as well as the macro level.

[9] According to the Credit Suisse Global Databook 2018, Ukraine and Kazakhstan rank first and second based on the wealth Gini index, respectively. https://www.credit-suisse.com/about-us/en/reports-research/global-wealth-report.html. Accessed October 2, 2018.

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Figure 1: Province-level famine intensity

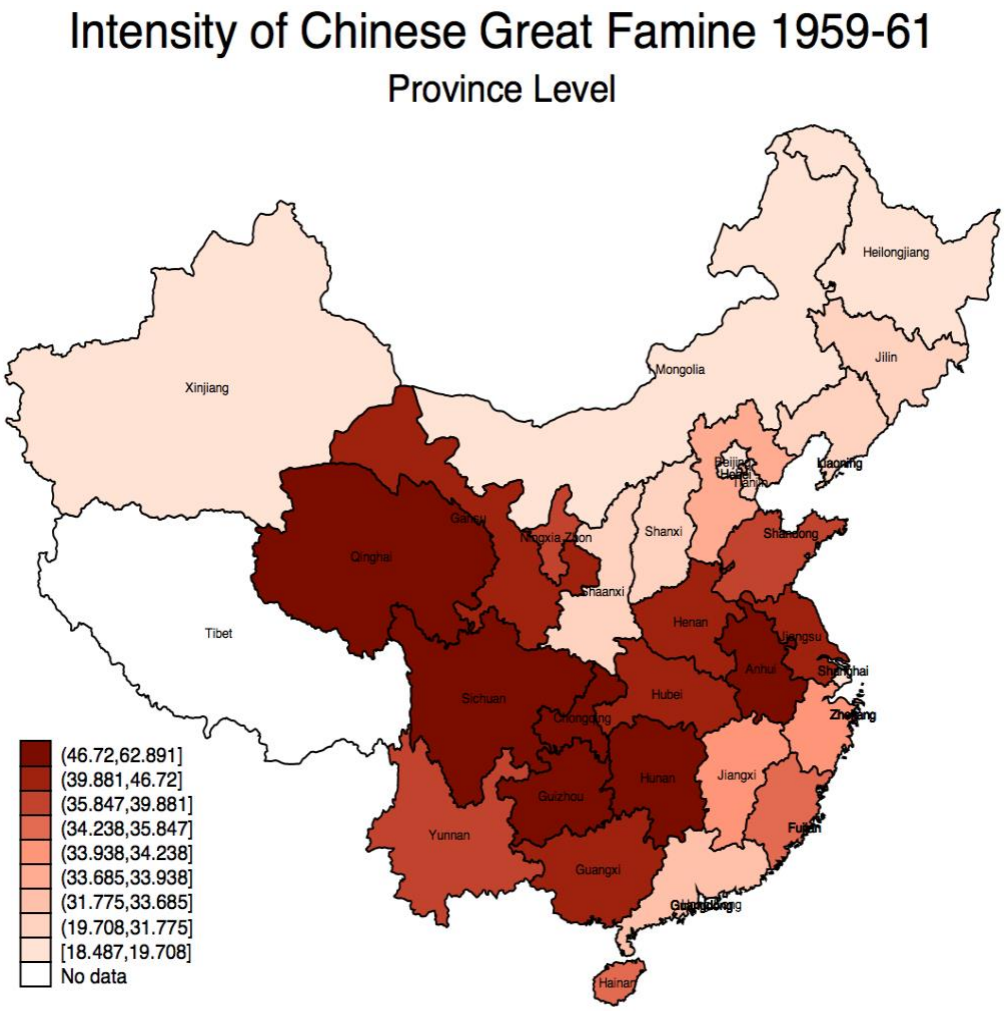

Figure 2. Log mean wealth (in US$) by year of birth (all years)

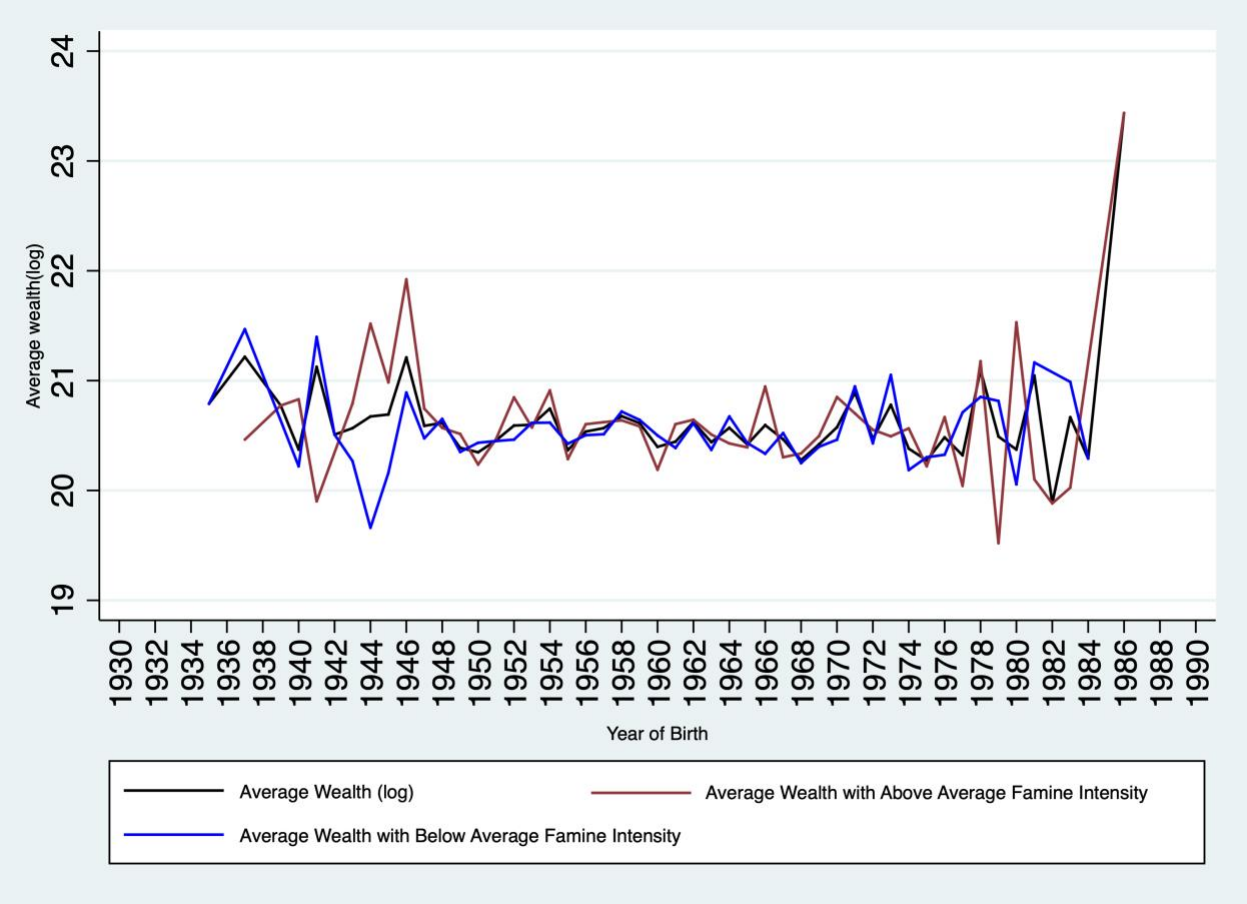

Figure 3: Year-on-year effect of famine on wealth inequality

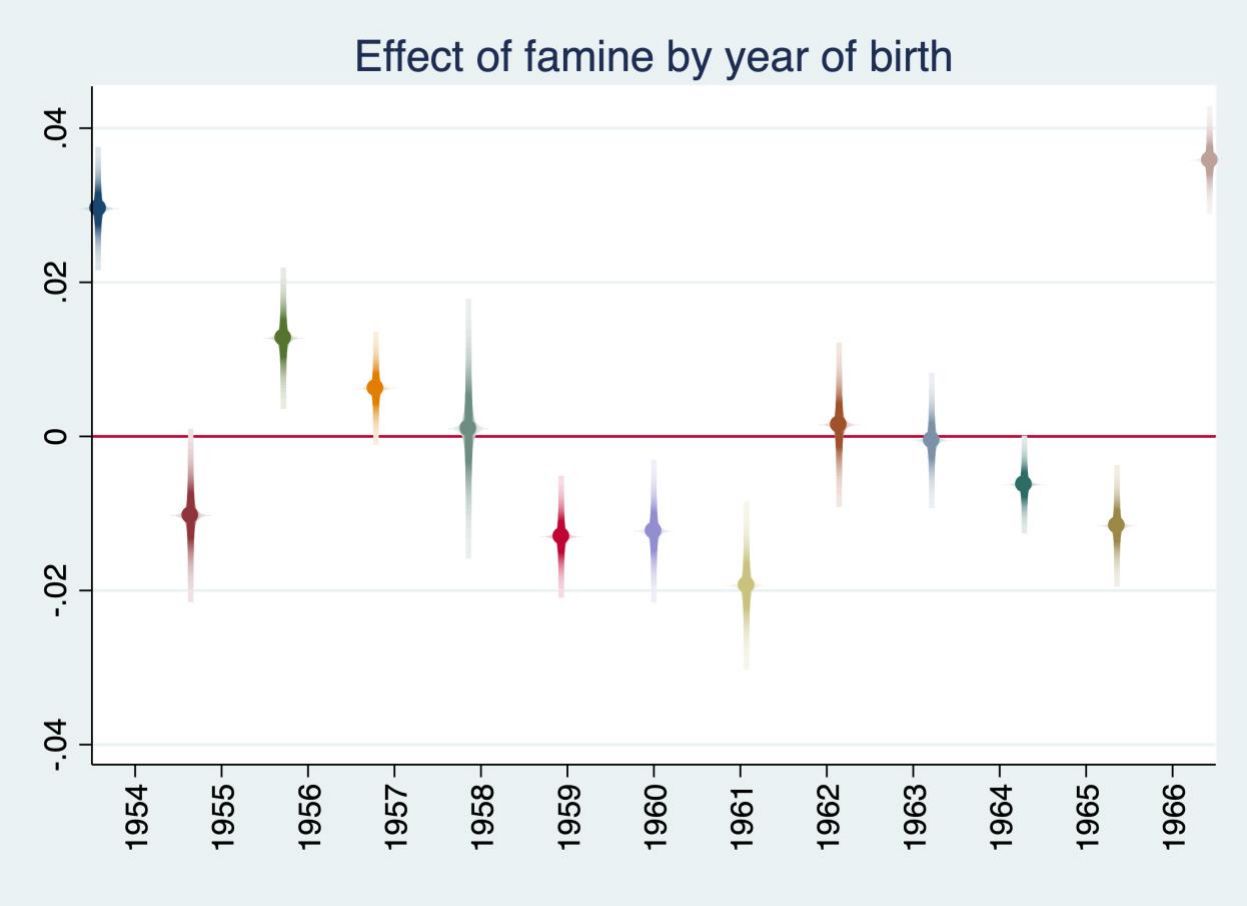

Table 1: Descriptive Statistics

	Provinces with above average Famine Intensity (1)	Provinces with below average Famine Intensity (2)	All (3)	Difference (Standard Error) (4)
Wealth (Log)	20.578	20.512	20.537	0.066**
	(0.853)	(0.783)	(0.811)	(0.031)
Born before the famine (before 1959)	0.378	0.337	0.352	0.041**
	(0.485)	(0.473)	(0.478)	(0.018)
Born during the famine (1959–61)	0.075	0.084	0.080	–0.009
	(0.263)	(0.277)	(0.272)	(0.010)
Born after the famine (after 1962)	0.548	0.579	0.567	–0.031*
	(0.498)	(0.494)	(0.496)	(0.019)
Famine Intensity	47.395	31.133	37.278	16.262***
	(8.337)	(6.033)	(10.540)	(0.266)
Birth Year	1960.821	1961.360	1961.156	–0.539*
	(8.133)	(8.389)	(8.296)	(0.315)
Sample Year 2016	0.362	0.352	0.356	0.010
	(0.481)	(0.478)	(0.479)	(0.018)
2017	0.310	0.324	0.319	–0.014
	(0.463)	(0.468)	(0.466)	(0.018)
No. of Observations	1114	1834	2948	

Notes: Standard deviations in parentheses for columns 1–3. Standard errors in parentheses for column 4.

Table 2: Change in Wealth

	(1)	(2)	(3)	(4)	(5)
	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)
Famine Intensity*Born during the Famine	-0.013***	-0.012***	-0.014***	-0.012***	-0.014***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Famine Intensity*Born before the Famine	0.003	0.003	0.002	0.004	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Famine Intensity	0.003	0.004		-0.004	
	(0.003)	(0.003)		(0.003)	
_cons	20.63***	20.62***	20.78***	20.67***	20.92***
	(0.123)	(0.123)	(0.191)	(0.127)	(0.215)
Birth Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	-	-
Province of Birth FE	No	No	Yes	No	Yes
N	2948	2948	2948	1049	1049

Notes: The table reports OLS estimates. The unit of observation is an individual. Standard errors are adjusted at the year of birth levels.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 3: Robustness

	Full Sample	15 years before and after	10 years before and after	5 year before and after
	(1)	(2)	(3)	(4)
	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)
Famine Intensity*Born during the Famine	-0.014***	-0.014***	-0.013***	-0.014**
	(0.004)	(0.003)	(0.004)	(0.006)
Famine Intensity*Born before the Famine	0.002	0.003	0.004	0.009
	(0.005)	(0.005)	(0.005)	(0.008)
_cons	20.78***	20.61***	21.16***	20.38***
	(0.191)	(0.27)	(0.253)	(0.387)
Other Controls	Yes	Yes	Yes	Yes
N	2948	2809	2513	1629

Notes: The table reports OLS estimates. The unit of observation is an individual. Other control variables include birth year fixed effects, ranking year fixed effects and province of birth fixed effects. Standard errors are adjusted at the year of birth levels.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 4: Placebo Test

	Born Before the Famine (All Sample)	Born Between 1953–58	Born After the Famine (All Sample)	Born Between 1962–1967
	(1)	(2)	(3)	(4)
	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)
Born Between 1956–58*Famine Intensity	-0.000	-0.010		
	(0.006)	(0.012)		
Born Between 1962–64*Famine Intensity			-0.004	-0.009
			(0.006)	(0.013)
_cons	20.82***	20.59***	19.80***	20.25***
	(0.339)	(0.739)	(0.472)	(0.680)
Other Controls	Yes	Yes	Yes	Yes
N	1039	533	1672	1033

Notes: The table reports OLS estimates. The unit of observation is an individual. Other control variables include birth year fixed effects, ranking year fixed effects and province of birth fixed effects. Standard errors are adjusted at the year of birth levels.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 5: Robustness (Using alternative measure of famine intensity)

	All Sample			2016 Cohort	
	(1)	(2)	(3)	(4)	(5)
	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)	Wealth (Log)
Born during the Famine* Excess Death Rate (1959–61)	-0.0187***	-0.0186***	-0.0189**	-0.0192***	-0.0196***
	(0.004)	(0.004)	(0.007)	(0.004)	(0.006)
Born before the Famine* Excess Death Rate (1959–61)	0.004	0.004	0.004	0.005	0.004
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Excess Death Rate (1959~61)	0.003	0.003		0.003	
	(0.004)	(0.004)		(0.004)	
_cons	20.78***	20.77***	20.78***	20.85***	20.90***
	(0.072)	(0.071)	(0.237)	(0.072)	(0.114)
Birth Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	-	-
Province of Birth FE	No	No	Yes	No	Yes
N	2948	2948	2948	1049	1049

Notes: The table reports OLS estimates. The unit of observation is an individual. Standard errors are adjusted at the year of birth levels.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.